Review
Author(s): Augustine O. Esogbue
Review by: Augustine O. Esogbue
Source: *Interfaces*, Vol. 6, No. 3 (May, 1976), pp. 89-91
Published by: INFORMS
Stable URL: http://www.jstor.org/stable/25059348
Accessed: 03-08-2016 08:13 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at http://about.jstor.org/terms

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

INFORMS is collaborating with JSTOR to digitize, preserve and extend access to *Interfaces*

The Leontief systems considered in this book represent a particularly powerful and important class of linear programming problems. The Leontief substitution structure of matrices seems, as the authors note, to arise in an incredible number of areas. Indeed, it is interesting that Professor Wassily Leontief did not personally investigate the notions discussed in the book. Yet the same fundamental ideas whose economic implications lead to his receiving the Nobel prize in Economics have programming implications that may be as important.

The authors' starting place is Professor Arthur F. Veinott's brilliant and fundamental work that showed how Leontief substitution systems could be solved quickly and easily. Indeed, Veinott's concepts are the underlying theme, almost the leitmotif, of the book. For they show far more than merely how to solve the relevant linear programming problem; they reveal how to solve certain concave cost minimization problems such as certain fixed charge problems, as well as provide keen insights into inventory theory, Markov decision processes, distribution and production problems, network analysis plus a host of other complex situations.

Certainly the authors make no claim to fundamental contribution in their book. But what they have done is put into one convenient place nearly all of the current research known about Leontief Substitution Systems, presented it in a logical framework, plus have added some new insights. For anyone who wants to learn the exceptional power and application of Leontief Substitution Systems, this book represents an excellent and highly recommended place to look.

Willard Zangwill
College of Commerce and
Business Administration
University of Illinois

ZADEH, LOFTI A., KING-SU FU, KOKICHI TANAKA, and MASAMICHI SHIMURA, (Ed.), *Fuzzy Sets and Their Applications to Cognitive and Decision Processes*, Academic Press, Inc., New York, N.Y., 1975, 496 pp, $16.00.

This book is a collection of ninteen papers contributed by participants in a U.S.-Japan Seminar on Fuzzy Sets and their Applications, held at the University of California, Berkeley. The seminar, part of the U.S.-Japan Cooperative Science Program, was jointly sponsored by the National Science Foundation and the Japan Society for the Promotion of Science. A parallel effort by the European Working Group on Fuzzy Sets has been quite productive, and has contributed significantly to the furtherance of the theory of fuzzy sets.

This book is the first published collection of important works dealing with various aspects of fuzzy sets. Since its inception in 1965 by Lofti Zadeh, this important, pervasive, but embryonic concept has spun in many directions receiving scattered treatment by professionals from diverse disciplines. With the exception of a monograph bearing an almost identical title by Negoita and Ralescu (written in Romanian 1974), this book represents the first serious effort to bring together the different concerns of fuzzy sets. The theoretical and few application oriented aspects are discussed by authors who are among the most prolific contributors to the development of fuzzy set theory.

The relevance of fuzzy set theory to the concerns of operations research and management science was brought into focus by the landmark article published in *Management Science,* Volume 17, No. 4 by Bellman and Zadeh. This book provides a useful introduction to the field as well as a crystallization of the essential thoughts and applications. The Operations Research-Management Science Specialist with interests in probability, topology, informatics, artificial intelligence, computer science, modelling, optimization, decision making and psychology will find this book particularly useful. The power of the method cannot be over emphasized.

The arrangement of the topics discussed in the book leave very much to be desired. There does not appear to be any logical sequence in the presentation and as such the reader cannot expect to study them sequentially. The theoretical papers are interspersed with the application oriented ones in a manner that completely obscures relevance and relationships. While no arrangement is fool proof, the following grouping will seem instructive:

A. *Aspects of Theory*: i) L. A. Zadeh, (U.S.A.), "Calculus of Fuzzy Restrictions", ii) C. K. Wong, (U.S.A.), "Fuzzy Topology", iii) A. Rosenfeld, (U.S.A.), "Fuzzy Graphs", iv) R. T. Yeh and S. Y. Bang, (U.S.A.), "Fuzzy Relations, Fuzzy Graphs, and Their Applications to Clustering Analysis", v) T. Terano and M. Sugeno, (Japan), "Conditional Fuzzy Measures and Their Applications".

B. *Computational or Algorithmic*: i) K. Tanaka and M. Mizumoto, (Japan), "Fuzzy Programs and Their Execution", ii) C. L. Chang, (U.S.A.), "Interpretation and Execution of Fuzzy Programs", iii) N. Honda and M. Nasu, (Japan), "On the Description of Fuzzy Meaning of Context – Free Language".

C. *Modelling and Applications*: i) T. Kitagawa, (Japan), "Fuzziness in Informative Logistics", ii) G. F. DePalma and S. S. Yau, (Japan), "Fractionally Fuzzy Grammars with Application to Pattern Recognition", iii) M. Shimura, (Japan), "An Approach to Pattern Recognition and Associative Memories Using Fuzzy Logic", iv) S. S. L. Chang, (U.S.A.), "On Risk and Decision Making in a Fuzzy Environment", v) L. W. Fung and K. S. Fu, (Japan), "An Axiomatic Approach to Rational Decision Making in a Fuzzy Environment", vi) K. Asai, H. Tanaka, and T. Okuda, (Japan), "Decision Making and Its Goal in a Fuzzy Environment", vii) L. Uhr. (U.S.A.), "Toward Integrated Cognitive Systems Which Must Make Fuzzy Decisions about Fuzzy Problems", viii) J. A. Goguen, (U.S.A.), "On Fuzzy Robot Planning", ix) M. Kokawa, K. Nakamura, and M. Oda (Japan), "Experimental Approach to Fuzzy Simulation of Memorizing, Foregetting and Inference Process", x) M. Kochen, (U.S.A.), "Applications of Fuzzy Sets in Psychology".

Zadeh's paper fuzzifies concepts often encountered in systems modelling and, in an appendix, introduces the reader to some basic properties, notations and terminology of fuzzy sets. The computational or algorithmic papers discuss fuzzy instructions programs and execution by the computer. Honda and Nasu propose a "recognition theory" similar to formal language theory for finite automata, push down automata, linear bounded automata and Turing machines. The application papers deal basically with four major areas: fuzzy decision making, pattern recognition, planning, and psychology. They range from a slightly mathematical application as in Asai, et al. to a philosophical software oriented description as in Uhr. The application to the interpretation of psychological studies (Kochen) is novel and quite interesting.

A very important aspect of this book is the almost exhaustive, chronological and up to date (1975) bibliography on fuzzy sets which Zadeh is in a unique position to provide. A similar activity is now in operation by the European Working Committee on Fuzzy Sets. The explosiveness of the field as indicated by the presentation of eleven technical papers dealing with fuzzy sets at the Third International Congress of Cybernetics and Systems in Bucharest shows a need to maintain a continuous record of progress in different parts of the world, in the field. Zadeh et al.'s book is the best single collection published yet, but it is incomplete especially with respect to applications. An example of important areas of applications pioneered and pushed by the European group but omitted in this book are personnel management, production and economic systems. With the exception of a few blank spaces and typographical errors, this book is generally of high quality.

This book is recommended as a valuable reference work on the subject not only to operations researchers and management scientists, but to any professional interested in various aspects of systems theory.

Augustine O. Esogbue
School of Industrial & Systems
Engineering
Georgia Institute of Technology